



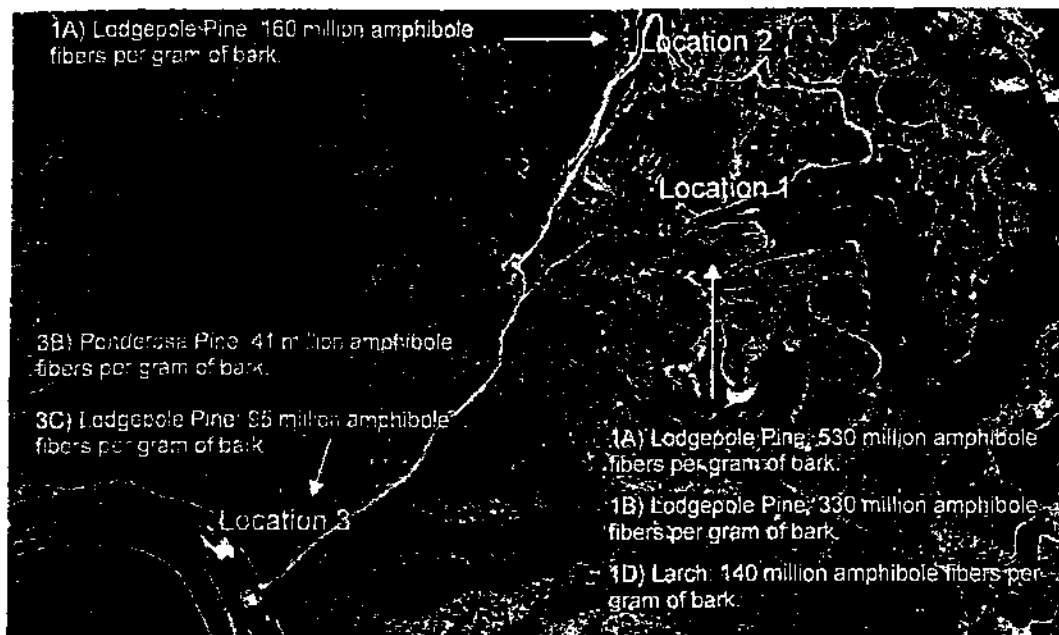
Table 1: Libby, Montana Bark Sample Location and Results
The University of Montana, Center for Environmental Health Sciences
August 26, 2005

Sample Point	Location, Description	Type of tree	Amphibole fiber concentration
*Location 1, Sample 1A	Approx. 100 yards from the former pump house site at the W. R. Grace Vermiculite Mine.	Lodgepole pine	530 million amphibole fibers per gram of bark
*Location 1, Sample 1B	Approx. 100 yards from the former pump house site at the W. R. Grace Vermiculite Mine.	Lodgepole pine	330 million amphibole fibers per gram of bark
*Location 1, Sample 1D	Approx. 100 yards from the former pump house site at the W. R. Grace Vermiculite Mine.	Larch tree	140 million fibers per gram
*Location 2	4 mile mark (from bottom of Raney Creek Rd). Immediately outside of the mine property.	Lodgepole pine	160 million fibers per gram
Location 3, Sample 3B	Approx. 20 yards from the decontamination trailer and access gate for Raney Creek Rd (outside of the restricted area, anticipated control).	Ponderosa pine	41 million fibers per gram
Location 3, Sample 3C	Approx. 20 yards from the decontamination trailer and access gate for Raney Creek Rd (outside of the restricted area, anticipated control).	Lodgepole pine	95 million fibers per gram
Location 4	Albany, New York (control)	Pine	No fibers at an analytical sensitivity of 20 million fibers per gram
Location 5, Sample 11	On the railroad line, approximately 7 miles west of Libby, MT.	Ponderosa pine	19 million fibers per gram
**Location 6, Sample 15	Commercial firewood pile west of town, Libby, MT.	Unknown (bark collected from ground)	2 million fibers per gram

*Location 1 and 2 samples were collected within the EPA restricted area surrounding the mine site. **For Location 6, the amphibole fiber concentration is near the analytical method detection limit (MDL).

LIBBY

Libby Mine Sampling Locations



LIBBY #3

Libby Meeting Summary
September 20, 2005

A meeting was held at the Lincoln County Environmental Health building in Libby on September 15, 2005 to discuss the proposed University of Montana (UM) bark sampling plan. The attendees were as follows:

Attendees

Mike Cirian – EPA
Bonnie Lavelle (by teleconference) - EPA
Catherine LeCours – Montana DEQ
Kathi Bales – Lincoln County
Tony Ward – UM
Lawrence Smith – USFS Libby R.D.
Mike Guthneck – USFS Libby R.D.
Ron Anderson – Lincoln County
Paul Lammers – CDM

Meeting Summary

At this meeting, Tony Ward (UM) presented his plan to collect bark samples focused on areas where people harvest firewood throughout the Libby valley, and near the point sources (mine, screening plant, export plant, old popping plant) in Libby. The goal of this program was to work towards verifying a clean home-heating fuel source for the Libby inhabitants, and also to establish a gradient radiating out from the historical point sources.

After a group discussion, the sampling plan was modified to focus on investigating Libby amphibole concentrations in bark samples collected at varying distances from the mine site. Samples will be collected in approximately quarter mile increments in directions (north, south, east, and west) emanating from the mine, with sample collection beginning this fall. Sampling will include different tree types (lodgepole, larch, Doug fir, ponderosa), and will include sampling at different heights of the tree (approx. 4 feet from ground, in the canopy, and from the limbs) for some of the tree samples. GPS points will be recorded at each location. Tony Ward will work with EPA to develop a more comprehensive sampling plan including Data Quality Objectives this winter (2005/2006).

The group then discussed what Tony Ward was to present to the Community Advisory Group (CAG) later that night. The consensus of the group was that no new sample results (currently 3 new sample results) would be released until a more comprehensive dataset has been obtained. At the CAG meeting, an update on the newly developed sampling plan was presented, as was the news that ATSDR has provided funding (\$24K) to begin the bark sampling program.

Libby, Montana Bark Sample Results
The University of Montana
Center for Environmental Health Sciences
October 16, 2005

LIBBY #3

At the May 2005 Libby Community Advisory Group (CAG) meeting, Tony Ward and Andrij Holian of The University of Montana, Center for Environmental Health Sciences (UM-CEHS) presented the results of preliminary bark samples collected at the Libby mine site. Following this, the residents of Libby requested that UM-CEHS collect bark samples from within the town of Libby. A second round of bark sampling was conducted in June of 2005. To date, only a subset of these samples have been analyzed by the Wadsworth Center, with these additional results (Locations 5-8) presented in Table 1.

Table 1: Sample Location and Results

Sample Point	Location, Description	Type of Tree	Amphibole fiber /gram bark	Analytical Sensitivity** (fibers/gram)	Amphibole fiber/cm²
*Location 1, Sample 1A	Approx. 100 yards from the former pump house site at the W. R. Grace Vermiculite Mine.	Lodgepole pine	530 million	28 million	100 million
*Location 1, Sample 1B	Approx. 100 yards from the former pump house site at the W. R. Grace Vermiculite Mine.	Lodgepole pine	330 million	21 million	260 million
*Location 1, Sample 1D	Approx. 100 yards from the former pump house site at the W. R. Grace Vermiculite Mine.	Larch	140 million	10 million	40 million
*Location 2	4 mile mark (from bottom of Raney Creek Rd). Immediately outside of the mine property.	Lodgepole pine	160 million	23 million	110 million
Location 3, Sample 3B	Approx. 20 yards from the decontamination trailer and access gate for Raney Creek Rd (outside of the restricted area).	Ponderosa pine	41 million	4.1 million	14 million
Location 3, Sample 3C	Approx. 20 yards from the decontamination trailer and access gate for Raney Creek Rd (outside of the restricted area).	Lodgepole pine	95 million fibers	10 million	54 million
Location 4	Albany, New York (control)	Pine	None detected	19 million	None detected
Location 5, Sample 11	On the railroad line, approximately 7 miles west of Libby, MT.	Ponderosa pine	19 million	1.2 million	5.8 million
Location 6, Sample 15	Commercial firewood pile west of town, Libby, MT.	Unknown (bark collected from ground)	0.88 million	0.44 million	0.51 million
Location 7, Sample 18	Libby Middle School track	Douglas fir	0.13 million	0.13 million	0.25 million
Location 8, Sample 23	Asa Wood Elementary School	Larch	None detected	0.42 million	None detected

*Location 1 and 2 samples were collected within the EPA restricted area surrounding the mine site.

**Based on one fiber detected.

The lack of amphibole fibers in the previously collected core samples indicated that amphibole fibers were not taken up by the root system of the tree and incorporated into the wood itself. Fibers found in the bark samples support our hypothesis that fibers can become embedded on the outside of the trees by diffusion and/or impaction-type processes. In an attempt to normalize the bark results to reflect this deposition on the surface area of the bark, we have changed the units in which we report the bark sample results. Depending on how much surface area is present in the sample can bias the analytical results, as the inclusion of unexposed bark effectively dilutes the concentration of asbestos fibers on a mass basis. To standardize measurement units on a deposition-related basis, future preparation and analysis of bark samples should be based on bark's exposed surface area. We estimate that the exposed surface areas of bark subsamples we prepared were approximately 2 cm^2 , and calculated the approximate concentration of amphibole fibers on an areal basis. The original way of reporting the samples (fibers per gram) and the new way of reporting the results (fibers per cm^2) are presented in Table 1, as is the analytical sensitivity (fibers per gram) of the method.

Converting the units to fibers per cm^2 also provides us with a way of comparing the bark results with a known reference. Comparison of these areal concentrations to asbestos measured in settled dust in the United States portends the significance of the Libby bark contamination. Ewing (2000) discusses concentrations of surface dust found in a variety of settings and suggests that a concentration of one thousand structures (fibers) per square centimeter may be considered clean whereas concentrations exceeding one hundred thousand fibers indicate contamination. Concentrations on Libby bark near the mine were in the hundred *million* fibers per square centimeter range, concentrations that were seldom measured in settled dust, and only on surfaces under exposed asbestos-containing fireproofing.

Although the asbestos surface dust values by Ewing (2000) provide a reference point from which to compare the bark results, it is important to stress that at this point, we do not know how the tree bark data translate in terms of human exposure risk. Further evaluations of wood processing activities (commercial logging studies, firewood harvesting simulations, etc.) could help characterize the potential for amphibole fibers to be liberated from bark during such activities.

Finally, on September 15, 2005, a more comprehensive bark sampling plan was developed by UM-CEHS with input from members of EPA (Bonnie Lavelle and Mike Cirian), USFS (Mike Guthneck and Lawrence Smith), Montana DEQ (Katherine Lecours), CDM (Paul Lammers), and Lincoln County (Kathi Bales and Ron Anderson). This plan calls for collecting bark samples at varying distances based on concentric rings radiating from the mine site to north, east, south, and west in an effort to establish a concentration gradient. Sampling is scheduled to begin in fall 2005.

References

Ewing WM. 2000. Further observations of settled asbestos dust in buildings. In *Advances in Environmental Methods for Asbestos*, M.E. Beard and H.L. Rook, eds. ASTM STP 1342.